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A PRELIMINARY REPORT ON THE GEOHYDROLOGY OF THE COLBERT LANDFILL SPOKANE COUNTY, WASHINGTON

PHASE I

Prepared for the
Spokane County Utilities Department

By
George Maddox and Associates, Inc.
in association with
James M. Montgomery, Consulting Engineers, Inc.

November 9, 1981

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INTRODUCTION

This report is intended as a summary document describing the work performed by George Maddox and Associates, Inc., and James M. Montgomery, Consulting Engineers, Inc., during Phase I of an investigation to study the geohydrology of the Colbert Landfill. The work was carried out under a contract between George Maddox and Associates, Inc., in association with James M. Montgomery, Consulting Engineers, Inc. The primary county agency administering the contract is the Spokane County Utilities Department.

Scope

The scope of work for the first phase of the study included the acquisition, compilation, and interpretation of all basic data and history of landfill operations for the purpose of developing a conceptual model of the geohydrologic system at the Colbert Landfill. This summary report presents these basic data, in both tabular and illustrative form. All interpretations of these basic data required for purposes of developing the conceptual model have been referenced to the basic data source. All recommendations for additional studies at the Colbert Landfill as may be conducted by Spokane County should be for the purpose of confirming the conceptual model of the geohydrologic system described herein.

Data Sources

Data sources used to compile information presented in this summary report have included the records of the Spokane County Utilities Department, the Spokane Health District, the Washington State Department of Ecology, the Washington State Department of Social and Health Services, the U.S. Geological Survey, and the National Oceanic and Atmospheric Administration. Additionally, many individuals from these agencies, as well as private citizens living near the Colbert Landfill, have generously supplied factual information not available from public records.

HYDROLOGIC CHARACTERISTICS

Three distinct aquifer systems have been identified beneath the Colbert Landfill. For the purpose of convenience in description, these three aquifers shall be referred to in this report as the upper sand, the middle sand, and the lower sand. In addition to these aquifers, some groundwater in the general vicinity of the Colbert Landfill is obtained from pre-Tertiary basement rock, locally referred to as "granite," "quartzite," or "metasediments." A few wells obtain groundwater from clay units that separate the upper sand aquifer from the lower sand aquifer. These clay units, for report purposes, are termed the upper clay and lower clay. The lower clay separates the middle sand from the lower sand aquifer. At some localities east and south of the Colbert Landfill, the middle sand aquifer is apparently absent and the lower and upper clay form one unit that lies directly upon the pre-Tertiary bedrock. The upper surface of this bedrock appears, on the basis of water well drillers' records, to be weathered and serves as an aquifer that is correlative with the lower sand aquifer.

Water Well Logs

A listing of all well logs reviewed for the Colbert Landfill and a general description of the above-named hydrologic units penetrated by each well appear on Table 1. The plotted location of these wells is shown on Figure 1. To aid our interpretation of subsurface information provided by water well drillers' logs, map data showing surface outcrops of geologic units were reviewed (Griggs, 1966). The general surface geology in the vicinity of the landfill is shown on the geology map (Plate 1). Together, this information was used to prepare three geologic cross sections in the general vicinity of the landfill. These cross sections and our interpretation of the rock units defined by water well drillers' logs are shown on Figures 2, 3, and 4. To provide both regional and detailed site-specific subsurface definition, three sets of maps using large and small scales were drawn to show structure contours on the top of the upper clay unit (figs. 5 and 6), structure contours on the top of the middle sand aquifer (figs. 7 and 8), and isopachs (points of equal thickness) of the upper clay unit (figs. 9 and 10).

Water Level Information

Using reported water-level information appearing on water well drillers' logs and some water-level measurements made by the Spokane County Health District, elevations of the potentiometric surface[1/] were plotted for the upper sand aquifer (figs. 11 and 12) and the middle sand aquifer (figs. 13 and 14). Owing to the paucity of wells in the general vicinity of the landfill that penetrate the lower sand aquifer, no reliable potentiometric surface could be plotted for that system. In plotting the potentiometric surface of both the upper and middle sand aquifers, only elevations of the potentiometric surface for wells completed in those aquifers were used as control points. This information, together with elevations on the top of the upper clay unit (figs. 5 and 6) and a few elevations of the top of the lower clay unit, were used to guide the potentiometric lines. As a final check, the structure contours (figs. 5-8) were used as control for the potentiometric contour lines prepared for both the upper and middle sand units (i.e., the location of the 1750-foot elevation of the potentiometric surface in the shallow sand aquifer could not cross the 1750-foot elevation of the structure contour drawn on the top of the upper clay unit).

Well Test Information

Using well-test information appearing on water well drillers' logs, estimates of the transmissivity of the upper, middle, and lower sand aquifers were made using the technique developed by Theis, et al. (1963). These calculations were made using the assumption that the storativity of the upper, middle, and lower sand aquifers is 0.13, which value was taken from information published by Johnson (1966). A tabulation of the estimated values for transmissivity of the upper, middle, and lower sand aquifers is shown on Table 2. Owing to the different test methods

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1/ Potentiometric surface is defined as the hydraulic or static head measured in cased wells completed within either the upper or middle sand aquifer, and represents an averaged, imaginary water surface within the individual aquifer units. Where groundwater flow in these aquifers is unconfined, the term potentiometric surface used in this report is synonymous with the term, water table.

employed by the various water well drillers, there was a wide variation in the estimated value of transmissivity for each aquifer (Table 2). Consequently, it was assumed that the mean of the range of values calculated for the transmissivity of each aquifer probably represents a better approximation than the values calculated from individual tests. The mean value for transmissivity of the upper sand aquifer was found to be approximately 18,000 gpd/ft. The mean value for transmissivity of the middle and lower sand aquifers was found to be 6,000 gpd/ft., respectively.

Groundwater Flow

The potentiometric surface contours in the middle sand aquifer (figs. 13 and 14) and structure contours showing the top of the middle sand aquifer (figs. 7 and 8) indicate that groundwater flow in this aquifer is unconfined (i.e., non-artesian). To analyze the potential for large-scale gain of groundwater by leakance from the upper sand through the upper clay to the middle sand aquifer, an idealized flow-net analysis was prepared. The flow net so constructed for the middle sand aquifer is shown on Figure 15. Owing to the paucity of water-level data for the upper sand aquifer, no flow net was prepared for this unit. The method used for constructing the flow net in the middle sand follows that described by Skibitzke and da Costa (1962). Using Skibitzke and da Costa's method for analysis of data shown by a flow net, the interval between the 1850 and 1900-foot level of the potentiometric surface was broken into unit squares. Owing to the absence of hydrologic boundaries, the beginning and ending of the sequence of unit squares were taken at convenient locations. By definition, the volume of groundwater flowing through each unit square is equal. Consequently, the volumetric analysis of groundwater through one unit square can be extended to other unit squares by simple multiplication. Extending each flow tube described by a unit square along the hydraulic gradient so that each flow boundary intercepts equipotential lines at right angles, it is possible to analyze the gain and loss of groundwater by each flow tube. This analysis is portrayed graphically and shown on Figure 16 for non-converging flow lines and Figure 17 where flow-line convergence has been eliminated by the method of data plot. Information shown in both Figures

16 and 17 indicates the absence of large-scale recharge of groundwater to the middle aquifer, either from downward leakance of water from the shallow sand aquifer or upward leakance of water from the lower sand aquifer.

Perched Groundwater

Designation of either the upper or middle sand aquifer units as perched aquifers would be inappropriate on the basis of information obtained from well drillers' logs (Table 1). Instead, analysis of the flow net (fig. 15) shows that substantial recharge by leakance to the middle sand aquifer does not occur within the area of investigation. Potentiometric information for the upper sand aquifer does not indicate it to be perched, but rather an aquifer that is separate from the underlying middle sand aquifer. Owing to the absence of a regional groundwater system in the area of investigation, it must be assumed that the lower sand aquifer does not constitute the regional aquifer, but that each of the three aquifers is a separate groundwater source, and as such do not constitute perched aquifers over a regional groundwater reservoir.

All records of the Spokane County Utilities Department and Health District, relating to solid waste in the Colbert Landfill, have been reviewed for the purpose of ascertaining the type of wastes in the landfill, the approximate dimensions of each waste cell, the location of dangerous or hazardous wastes, and operating practices at the Colbert Landfill. This review of records provided basic information from which a general map of the location of waste cells in the Colbert Landfill could be made and established the dates of active waste burial in most cells. This information is shown on Figure 18.

Dangerous Wastes

Most often, the type of wastes disposed of in the area shown on Figure 18 for dangerous waste disposal is animal waste from nearby meat packing operations. On one occasion, April 22, 1969, eleven 5-gallon metal containers and two half-full barrels of methylparathion were disposed of in the dangerous waste disposal site at the Colbert Landfill. All materials in contact with the disposed methylparathion, the containers of which had been damaged during transit, were buried in the dangerous waste disposal site, together with the 5-gallon containers and barrels of methylparathion. The dangerous waste was covered with two feet of soil and no further wastes were disposed of at that burial site. Based on information provided by a local electronics equipment manufacturing firm, it appears that on or before 1975 1,1,1-trichloroethane and methylene chloride were disposed of in various operating trenches at the Colbert Landfill site. The method used for disposing of the 1,1,1-trichloroethane and methylene chloride, which was conveyed in a liquid state to the landfill, was to dump the liquid over existing solid waste so that the liquid would be adsorbed by the waste in the trench. The area where the 1,1,1-trichloroethane and methylene chloride were deposited on waste and normal landfill operations continued. This procedure for disposing of the 1,1,1-trichloroethane and methylene chloride continued until late 1980 when of both 1,1,1-trichloroethane and methylene chloride were detected in private water supply wells located north of the Colbert Landfill's northern boundary. Since that time, the electronics manufacturing firm has discontinued disposing of these chemical wastes at the Colbert Landfill.

The only other available records of dangerous waste disposals indicate the presence of an unknown amount of sodium chlorate (1975); eight triple-rinsed, 5-gallon cans of 2,4-D, twenty gallons of 98% motor oil and 2% MSMA, seventeen 55-gallon drums of ferric chloride (1979); and 500 to 600 pounds of bagged and identified asbestos cloth disposed of every three months (1980).

Operating Procedures

Operating procedure for the Colbert Landfill is to use a scraper or dozer to excavate a disposal pit oriented generally north-south in direction (fig. 18), approximately 30 feet wide, and reaching depths of 20 to 25 feet below land surface. Each new pit is excavated so that its west boundary intersects, or nearly intersects, wastes previously disposed of in the adjacent, filled pit. Landfill operation is by contract operator. Equipment used at the landfill in normal operation are bulldozer-type, tread equipment and covering is placed on all waste at the end of each day of operation. Upon filling a trench, approximately two feet of cover are placed over the top of the filled trench. Cover placement is with bulldozer-type, tread equipment.

Characteristics of Covering Soil

To ascertain the density of soil used to cover closed pits, soil density measurements were made at five locations at the Colbert Landfill (fig. 18). These soil density determinations were made by means of the sand cone method and in accordance with ASTM D 1556-64 (reapproved 1974). A sample of soil taken at each site of density determination was submitted for laboratory analysis to determine both grain size and moisture density relationships in accordance with ASTM D-1557 Method "C." All information relating to soil density, grain size, and moisture density curves at sample points for the Colbert Landfill is shown in Appendix A. Information obtained from the soil study was noted on the cell map (fig.

18) where each soil type is classified according to the Unified Soil Classification System (Table 3), and the percent maximum density of the covering soil on each closed cell is shown as a percentage value.

These tests show that the covering soil is a well-graded sand or gravelly sand (SW, from the Unified Soil Classification System) that is compacted to near-natural condition when placed as covering fill in active trenches and as cover material on closed cells. At higher moisture content for the soil (8%), these data show that soil cover could be placed at about 120 lbs/cu.ft., which soil density would further decrease the possibility of moisture from precipitation reaching the buried waste.

Percolation Tests

Soil percolation tests to determine the permeability of closed cell cover and native soil conditions were conducted at two locations in the Colbert Landfill site. The testing procedure is a variation of soil percolation tests developed by Johnson (1963) and Bouwer (1961).

A constant head of water, gauged by a Fischer-Porter flotometer and measured in gallons per minute, was maintained in a cylinder of known dimensions. Percolation rates are expressed in gpm/cu.ft. and are determined by dividing the flow rate by the known surface area of the cylinder interior. Because the head and surface area are constants, any variation in flow is directly proportional to percolation rate. A two-hour percolation test was considered sufficient because the most representative results of soil permeability characteristics occurred within the first two hours of testing. Testing data was then plotted on semi-logarithmic paper as percolation rate versus elapsed time.

Closed cell soil cover in the vicinity of proposed sludge beds (Appendix A) displayed a decreasing percolation rate from an initial 2.58 gpm/cu.ft. to a minimum final reading of 1.52 gpm/cu.ft. Rate stabilization appeared to occur at the end of the test.

Native soil percolation rates (Appendix A) decreased steadily from an initial 3.15 gpm/cu.ft. to a stabilized rate of 2.75 gpm/cu.ft. beginning 70 minutes after the start of the test.

Results of the tests indicate that the percolation rates are lower in the closed cell area than in native soils. Though sand cone tests determined a close similarity in dry density between closed cell cover and native soil conditions, percolation rates indicate lower soil permeability in the closed cell area, which may be the result of compaction of the cover soil.

METHANE GAS

The presence of methane gas at the Colbert Landfill was tested for by means of an Enmet Portable Gas Detector, Model No. CGS 100. Test procedures consisted of making traverses across the landfill along a pre-determined grid system while monitoring for percent oxygen, concentration of toxic gas (carbon monoxide), and percent of combustible gas (methane). Readings were taken at ground surface and in depressions, drainage channels and open pits within the immediate boundaries of the landfill.

The preliminary methane testing at the Colbert Landfill failed to detect measurable quantities of methane at the surface or within any structures on the site. These results indicate that, while methane gas may be present in the subsurface, there is no concentration or collection of methane gas at the surface of the landfill during dry summer conditions. Additional testing during periods of ground freezing should be conducted during Phase II investigations to monitor for methane presence when soil permeabilities are reduced and the potential for methane concentration is enhanced. To test for the presence of methane generation in the covered waste cells and general subsurface beneath the landfill, test wells should be drilled and monitoring wells constructed.

GROUNDWATER QUALITY

In October 1980, on the basis of a citizen complaint, the Washington State Department of Ecology began surveillance of groundwater quality in the vicinity of the Colbert Landfill. Periodic sampling of the groundwater resource has continued. Information obtained from selected wells included in these water-quality sampling surveys is shown on Tables 4, 5, 6, and 7. The reason for the repeated sampling was the presence of 1,1,1-trichloroethane in extremely high amounts in the [redacted] well (Well #79, Table 1). Most of the wells included in the sampling survey provide water for domestic purposes and, for this reason, several of the wells do not have available drillers' logs to show well depth and construction specifications. Wells for which no drillers' log is yet available show the notation of "nd" for aquifer because without this information no determination can be made about the aquifer serving groundwater to the well. All wells included in the sampling survey and appearing on Tables 4 through 7 have been related by well number to the general tabulation of all wells shown on Table 1 and Figure 1.

Groundwater Contamination

Water-quality information developed by the sampling survey demonstrates a very significant contamination of groundwater adjacent to the Colbert Landfill site. As shown on Tables 5, 6, and 7, the contamination observed to date has occurred primarily from a number of volatile organic compounds. Table 4 shows that the inorganic chemicals analyzed are generally within acceptable limits established by the U.S. Environmental Protection Agency and are apparently not contributing to existing groundwater contamination. Relating this contamination to a specific aquifer is somewhat difficult due to the absence of water well drillers' logs for some of the wells included in the sampling survey. However, the [redacted] well has been identified by our investigation as obtaining groundwater from the lower sand aquifer. This well has the highest levels of organic contamination of all wells included in the survey.

Both water samples from King Springs, a surface water source; the Armon well, now the Stillwell well (Well #73b); and the Rhodes well (Well #73a) all show the presence of organic contamination, though not as high as levels reported from the [redacted] well. Two of these water sources, King Springs and the Armon well (Well #73b), obtain groundwater from the upper sand unit. The Rhodes well (Well #73a) apparently obtains water from the upper clay unit. So far as existing data allow us to understand the water sources for various wells in the general vicinity of the Colbert Landfill, only one of the wells sampled, the [redacted] well (Well #186), obtains groundwater from the middle sand aquifer. The apparent northward spread of the contaminant plume from the landfill may not be due to an actual dilution of the contaminant by circulating groundwater, but may be due to the samples of groundwater from the [redacted] well, King Springs, the [redacted] well, the [redacted] well, and the [redacted] well coming from different aquifers. Available information does not indicate any of the sampled wells, other than the [redacted] well, obtaining groundwater from the lower sand aquifer.

Contaminant Source and Distribution

The principal organic contaminants that have been found in wells surrounding the Colbert Landfill include 1,1,1-trichloroethane, 1,1-dichloroethylene, 1,1-dichloroethane (methylene chloride), trichloromethane (chloroform), 1,2-trans-dichloroethylene, and tetrachloromethane (carbon tetrachloride) in decreasing order of occurrence (Tables 5, 6, and 7). These compounds are used in a variety of industrial processes such as solvents for cleaning metals, plastic molds, degreasing, dry cleaning, oils, rubber and paint products. They are also used in the production or manufacturing of plastics, electronic equipment, organic chemicals, and pharmaceuticals. 1,1,1-Trichloroethane is commonly found in household solvents and cleaning solutions; trichloroethylene is used for cleaning of septic tanks. Thus, it is possible that sources of contamination could occur from municipal and industrial wastes deposited in the landfill and/or from areas outside the landfill, such as drainfields, septic tanks or other unknown sources.

The distribution and concentration of a particular contaminant in groundwater depends on several factors, including adsorption/desorption, dispersion, biodegradation, time of input, flow of water, and solubility in water. The volatile organic compounds described above are generally insoluble in water. As such, they would tend to be non-polar and would be expected to adsorb to non-polar surfaces, such as soils containing organic materials. Since the rate and capacity of adsorption is proportional to the amount of organic material, a humus-rich soil would normally adsorb more of these compounds than would a clay or sand. Because soil conditions at the landfill include mostly sand and clay poor in organic materials, adsorption may play only a small role in the attenuation of the above-described organic compounds. Conversely, clay would tend to adsorb or cause attenuation of inorganic chemicals. For this possible reason, there is an absence of inorganic contamination in wells near the landfill. Even though the organics have a limited solubility in water, they would tend to travel radially in water above a clay layer. Therefore, in order for the organics, in the quantities detected, to penetrate the clay layers separating the upper-middle and the middle-lower sand aquifers, discontinuities in both clay layers would have to exist. Consequently, wells in the immediate vicinity of the landfill are a prime suspect as the source for discontinuities of the two clay layers.

Contamination by Leachate

Using information shown on Figure 11, which depicts the potentiometric surface for groundwater in the upper sand in the general vicinity of the Colbert Landfill, and information shown on Figure 6, which depicts structure contours on the top of the upper clay in the immediate vicinity of the Colbert Landfill, it is difficult to see how leachate from the landfill could percolate over the structural rise in the top of the upper clay (fig. 6), move by unsaturated flow to the north, join groundwater in the upper sand aquifer and the upper clay unit to appear at the Rhodes and (b) (6) wells. Based on the existing data as depicted in Figures 6 and 11, it would appear that the source of contamination in the Rhodes and Armon wells must lie to the north and east of these wells. However, this seems contradictory since: 1) the apparent groundwater gradient is from the northeast to southwest, and 2) there are no known sources of contaminants north or east of these wells; and the [redacted] well, showing the highest contamination, is to the south and in closest proximity to the landfill, a known location of 1,1,1-trichloroethane and other organic contaminants.

The high amount of groundwater contamination in the [redacted] well is, likewise, somewhat difficult to explain by leachate movement from the Colbert Landfill through the upper sand, upper clay, middle sand, lower clay and into the lower sand aquifer. If, however, leachate from the Colbert Landfill containing 1,1,1-trichloroethane were to percolate by non-saturated flow from the landfill to the top of the upper clay unit, spread to the [redacted] well, flow down the annular space between the well casing and the borehole of the [redacted] well, it is possible that contamination in the [redacted] well could result from the Colbert Landfill. From the discussion presented above, it is clear that more site-specific data are needed.

CONCLUSIONS AND RECOMMENDATIONS

Our investigation of existing data for the Colbert Landfill leads us to the following conclusions:

1. There are three principal aquifers serving most wells in the general vicinity of the Colbert Landfill.

2. Two clay units separate the three principal aquifers.

3. Groundwater movement in both the upper and middle sand aquifers is controlled in part by the upper and lower clay units. Thus, groundwater in the upper and middle sand aquifers flows around portions of the upper clay and lower clay that rise higher in elevation than the potentiometric surface of groundwater in the upper and middle sand aquifers.

4. The area where the upper clay and lower clay units force groundwater in the upper and middle sand aquifers to diverge and flow around portions of the clay units is in the general vicinity of the northern one-half of the Colbert Landfill.

5. Information available from water well drillers' logs provides a general insight into the geohydrologic system in the general vicinity of the Colbert Landfill. The quantity and accuracy of this information does not, however, provide a sufficiently detailed analysis necessary for determining the nature, occurrence, and movement of leachate contamination to and within groundwater aquifers in the general vicinty of the landfill.

6. Dangerous organic wastes deposited in the landfill, including 1,1,1-trichloroethane and methylene chloride which now appear in nearby wells, should be adsorbed by organic materials in the landfill.

7. Low precipitation (a long-term average of 17.42 inches) and low permeability of waste-cell cover soils should act to minimize the amount of moisture that reaches buried waste and thereby decrease the opportunity for mobilization of the dangerous organic wastes in the landfill by percolating waters.

8. The presence of methane gas was not detected at the surface or within any structures or utilities at the Colbert Landfill. Additional surface monitoring should be conducted during the winter months when reduced surface permeabilities could enhance methane concentration. No conclusions can be reached using current data relative to methane generation and migration in the subsurface beneath the landfill. Exploratory drilling and monitoring should be conducted at the Colbert Landfill.

9. Water quality information obtained to date for various wells in the general vicinity of the Colbert Landfill is not sufficient to provide a clear understanding of the water-quality characteristics of groundwater aquifers in the area.

Our recommendations for establishing a testing program to confirm accuracy of the geohydrologic model described in this report and to expand areas of data deficiency include the following:

1. A test drilling program to evaluate the accuracy of the change in elevation of the upper clay unit in the general vicinity of the Colbert Landfill. The proposed locations of these drill holes are shown on Figure 19, and the approximate depth and purpose of each drill hole is shown in Appendix B. Three additional test wells should be constructed into the lower sand aquifer to provide specific information on the contamination observed at the [redacted] well. The locations of these three deep wells will be selected after the completion of water quality sampling of existing wells. It should be noted that the borehole locations shown on Figure 19 are tentative and may change as new exploratory data are developed. All test wells will be used to monitor for the pressure of methane gas at depth.

2. The water from several wells penetrating each aquifer in the general vicinity of the Colbert Landfill should be sampled so that a more finite identification may be made of the location and source of groundwater contamination near the Colbert Landfill. The locations of wells contemplated for inclusion in this groundwater quality survey are shown on Figure 19. At all wells to be included in the water-quality survey, samples will be collected for analysis of major cations and anions, phenols, iron, and total organic carbon (TOC). Additionally, samples will be collected at each sample point for analysis of volatile organics by liquid-liquid extraction.

3. Soil cuttings from test holes drilled through the buried waste should be examined to determine the amount of organic wastes disposed of in the landfill that are adsorbed by the buried waste and the amount of these organic wastes that can be found at varying depths in soil underlying the buried waste.

4. The validity of rock units identified in this report and which are based upon water well drillers' logs should be confirmed using electric borehole logs (gamma and gamma-gamma) of deeper existing wells and correlated with borehole logs and cuttings from the three deep test wells proposed.

5. The location and elevation of land surface should be determined at each existing well in the area of study and at each additional well and borehole proposed herein. In this manner, all data correlation can be realted to a common grid and data plane.

6. Drill cuttings and soil samples from all proposed boreholes should be submitted to laboratory analysis to determine the presence of leachate, including dangerous organic wastes.

7. Water quality data gathered from existing wells should be related to well location, aquifer, and potentiometric surface before the data are used for interpretation of groundwater quality and leachate, including dangerous organic waste migration.

8. A minimum of three of the borings recommended herein should be placed near existing septic tank drainfields so that the potential of this source of dangerous waste contamination of groundwater can be evaluated.

9. The three wells proposed for testing groundwater in the lower sand aquifer should have casing sealed to the upper and middle clay units so there is no percolation of groundwater from higher aquifers into the lower sand aquifer.

10. All drilling equipment, casing and testing equipment should be cleaned and sterilized prior to being placed in wells. Samples of all sterilized casing and of all sealing compounds should be taken and used as a reference standard to make certain that test well construction does not introduce contamination to the groundwater system.

11. All water quality samples should be accompanied to the laboratory by travel blanks.

12. Work on test drilling and water-quality sampling in the general vicinity of the Colbert Landfill should begin as soon as possible. A proposed maximum budget for work contemplated for the Colbert Landfill is shown in Appendix C.

FOR GEORGE MADDOX AND ASSOCIATES, INC.

Dr. George E. Maddox, P.E.
President

GEORGE E. MADDOX
STATE OF WASHINGTON
106 77
REGISTERED
PROFESSIONAL ENGINEER

FOR JAMES M. MONTGOMERY,
CONSULTING ENGINEERS, INC.

Robert H. Ramsey
Hydrogeologist

CERTIFIED
OREGON
ROBERT H RAMSEY
E406
ENGINEERING GEOLOGIST

GEM/RR:pm

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TABLE 1 - A tabulation of all water well records reviewed to develop a conceptual model of the geohydrology at the Colbert Landfill, Spokane County, Washington.

								Casing Schedule				
Well No.	Well Location	Current Ownership	Land Surface Elevation (ft.)	Date Well Drilled	Field Location Checked	Pump Test Data Available	Units Penetrated* (top-bottom)	length (ft.)	cased out units*	depth of seal (ft.)	Water Quality Data Avail.	Type [illegible]f [illegible]er Use**
1	SE4SW4,27,28N,43E	Mr. P.N. Collings	1720	7/22/77	no	yes	US,UC,MS,LC	82	US,UC	20	no	A
2	SE4SE4,27,28N,43E	Bruce Burchard	1718	4/12/77	no	yes	US,UC	134	US	20+	no	A
3	NE4NE4,27,28N,43E	Martin Shjerve, Jr.	1800	6/30/78	no	yes	US	42	--	20	no	A
4	W2NE4,27,28N,43E	Chet Gehrett	1750	9/16/80	no	yes	US,UC,MS	172	US,UC	100	no	A
5	N2,SW4,27,28N,43E	Fred Schrader	1910	10/25/79	no	yes	US,UC/LC	72	US	40	no	A
6	SW4SE4,27,28N,43E	Kenneth G. Thomas	1700	7/77	no	yes	US	21	--	nd	no	A,D,F
7	SW4NE4,27,28N,43E	Carl F. Wegeleben	1840	12/10/72	no	yes	US	20	--	0	no	A,D
8	SE4,28,28N,43E	Harry Miracle	1840	9/12/79	no	yes	US/MS,G	90	--	40	no	A
9	SW4SW4,28,28N,43E	Bob Bass	1880	11/12/77	no	yes	UC/LC,G	60	--	20	no	A
10	S2SE4,28,28N,43E	William & Florence Clark	1870	6/29/78	no	yes	US,UC/LC	164	--	20	no	A
11	NW4NW4SE4,28,28N,43E	James P. Bierce	1850	11/30/77	no	yes	US	169	--	18	no	A
12	SW4SE4,28,28N,43E	Clinton Baum	1864	1/23/79	no	yes	US,UC,MS,LC,LS	242	US,UC, MS,LC	20	no	A
13	SW4SE4,28,28N,43E	Sandra Jones	1864	7/12/74	no	yes	US,UC,MS	175	US,UC	22	no	A
14	SW4SE4,28,28N,43E	Tom Plaster	1864	8/31/77	no	yes	US,UC,MS,LC	258	US,UC,MS	20	no	A
15	SE4NE4,28,28N,43E	F. Bud Chamberlain	1865	9/13/75	no	yes	US,UC,MS	200	US,UC	18	no	A
16	SW4,28,28N,43E	Jim Rider	1885	11/28/77	no	no	US,UC/LC,G	168	US,UC/LC	18	no	E
17	N2NW4SW4SE4,28, 28N,43E	Al J. Boyd	1885	7/21/75	no	yes	US	74	--	18	no	A [illegible]
18	SW4NE4,28,28N,43E	Mark Kemper	1855	7/20/76	no	yes	US,B	110	US	50	no	A
19	N2SE4,29,28N,43E	Rich Spies	1880	2/22/78	no	yes	UC,MS,LC	70	UC	25	no	A
20	SE4SE4,29,28N,43E	Robert E. Bass	2000	2/4/77	no	no	B/C/B/C	40	B/C	nd	no	A
21	SE4SE4,29,28N,43E	Robert E. Bass	2000	2/10/77	no	yes	B/C/B,UC,MS,G	278.25	B/C/B, UC,MS	80	no	A
22	SE4NE4,32,28N,43E	Ben Redfield	2060	10/18/55	no	no	infiltration trench	nd	nd	nd	no	nd
23	SW4SE4SW4,32,28N,43E	Delmer C. Nokes	2080	7/10/73	no	yes	US,B,UC/LC	140	--	nd	no	A,D
24	SW4SE4,33,28N,43E	Jerry Bleck	1760	7/29/74	no	yes	UC,MS	136.67	UC	136	no	A
25	SW4SW4,33,28N,43E	C.L. Holford	2000	9/23/76	no	yes	UC,B	89	UC	20	no	A
26	SW4SW4,33,28N,43E	C.L. Holford	2000	4/13/79	no	yes	--B,UC/LC	nd	nd	nd	no	A
27	NW4NW4,33,28N,43E	Harry Egland	1720	4/28/79	no	yes	US,UC	118	US	25	no	A
28	NW4NE4,33,28N,43E	Doug Iverson	1850	2/21/78	no	no	US,B,UC/LC	25	--	18	no	A
29	NE4SW4,33,28N,43E	Brian March	1850	6/24/76	no	yes	UC,B,UC/LC	21	UC	20	no	A
30	NW4NE4,33,28N,43E	Larry Hersom	1800	3/17/79	no	yes	US,UC,B,LC,G	203	US,UC,B	20	no	A
31	SE4SE4,33,28N,43E	C.A. Schmidt	1685	5/30/51	no	no	nd	nd	nd	nd	no	nd
32	SW4NE4,34,28N,43E	George Minata	1805	9/18/78	no	yes	US,UC,MS	176	US,UC	20	no	A
33	NE4NE4,34,28N,43E	Joe Westenskow	1805	6/12/79	no	no	US,G	174	US	18.5	no	A
34	SW4NE4,34,28N,43E	George Minata	1805	9/18/78	no	yes	US,UC,MS	176	US,UC	20	no	A
35	SW4NE4,34,28N,43E	Bryan Connall	1805	8/29/77	no	no	US,B,UC/LC	171	US,B	18	no	A
36	S2S2,NE4SW4,34, 28N,43E	Mike West	1815	5/10/77	no	yes	US	93.5	--	70	no	A
37	NE4SW4,35,28N,43E	Wilma Hall	1890	11/24/77	no	yes	US,UC/LC	239.5	US	20	no	A

TABLE 1 - Continued

Well No.	Well Location	Current Ownership	Land Surface Elevation (ft.)	Date Well Drilled	Field Location Checked	Pump Test Data Available	Units Penetrated• (top-bottom)	Casing Schedule length (ft.)	Casing Schedule cased out units•	depth of seal (ft.)	Water Quality Data Avail.	Ty o Wa U
38	SE4NW4,35,28N,43E	(b) (6) [redacted]	1875	6/15/77	no	yes	US,UC,B	99	US,UC	20	no	
39	NW4NW4,35,28N,43E		1880	5/5/80	no	yes	US,B/C/B	71	US,B/C	40	no	
40	SW4SW435,28N,43E		1890	7/25/77	no	yes	US,UC,MS,LC	264	US	20	no	
41	35,28N,43E		1885	4/29/78	no	yes	US,C/B/C/B	86	US,C	20	no	
42	NW4NW4,35,28N,43E		1880	7/5/79	no	yes	US,B/C/B	37	US	36	no	
43	35,28N,43E		nd	6/26/72	no	yes	US,UC,MS,LC,LS	230	US,UC,MS	nd	no	
44	NE4SW4,35,28N,43E		1890	11/6/74	no	no	US	113	--	20	no	
45	nd		--	8/11/72	no	yes	US	124	--	15	no	
46	SE4NE4,1,27N,43E		2380	9/29/77	no	yes	B,UC,MS,LC, LS,C,S, C,G	347	B,UC,MS, LC,LS,C,S	nd	no	
47	SW4SE4,1,27N,43E		1945	3/13/78	no	no	C/S/C/S/C/S,G	150	C/S/C/ S/C/S	18	no	
48	SW4SW4,1,27N,43E		1925	4/5/79	no	yes	US,UC/LC,G	151	US	20	no	
49	SW4SE4,1,27N,43E		1940	3/16/78	no	no	C/S/C/S,G	140	C/S/C/S	18	no	
50	NW4SW4,1,27N,43E		2040	7/25/73	no	yes	UC,B,UC,MS	287	UC,B	0	no	
51	NE4SE4,2,27N,43E		2030	3/27/79	no	no	UC,B,UC/LC	186	UC,B	nd	no	
52	SW4SE4,1,27N,43E		1940	3/21/78	no	yes	UC,MS,LC	135	UC	18	no	
53	NW4SW4,2,27N,43E		±1878	7/13/77	yes	yes	US,UC,MS,LC,G	299	US,UC, MS,LC	30	no	
53a	NE4SW4NW4SW4,2, 27N,43E		±1878	4/22/77	yes	yes	US,UC,B/C/B, MS,LC,G	174.5	US	18	no	
54	SW4NW4,2,27N,43E		1881	4/18/78	no	yes	US,UC,MS,LC	222	US	20	no	
55	NE4NW4,2,27N,43E		1890	5/19/78	no	yes	US	111	--	20	no	
56	NW4NW4,2,27N,43E		1905	5/11/78	no	yes	US,UC,MS	251	US	20	no	
57	NW4NW4,2,27N,43E		1905	2/20/78	no	yes	US,UC,MS,LC	259	US	20	no	
58	SW4NW4,2,27N,43E		1881	6/30/77	no	yes	US,UC,MS	262	US	20	no	
59	NE4NW4,2,27N,43E		1890	8/8/78	no	yes	US,UC	119	--	20	no	
60	NW4,2,27N,43E		±1900	7/7/78	yes	yes	US,UC	133	--	20	no	
61	NE4,NW4,2,27N,43E		1890	11/7/77	no	yes	US	118	--	20	no	
62	NE4,NW4,2,27N,43E		1890	4/5/78	no	yes	US,B	94	--	20	no	
63	NE4NW4,2,27N,43E		1890	11/2/77	no	yes	US,B/C/B	129	US,B/C	20	no	
64	NW4,2,27N,43E		2140	5/28/78	no	yes	US,UC,MS,LC	277.25	US,UC	20	no	
65	NE4NW4,2,27N,43E		1890	3/27/78	no	yes	US,UC,MS	265.5	US	20	no	
66	SE4NW4,2,27N,43E		1885	10/7/77	yes	yes	US,UC,MS,LC	190	US	20	no	
67	NE4NW4,2,27N,43E		1890	6/6/77	no	yes	US,UC,MS,LC	138	US,UC	20	no	
68	SE4NW4,2,27N,43E		1885	12/27/77	no	yes	US,UC/LC,G	267	US,UC/LC	20	no	
69	SE4NW4,2,27N,43E		1885	8/19/77	no	yes	US,UC,MS,LC	261	US	20	no	
70	SE4NW4,2,27N,43E		±1885	9/27/77	yes	yes	US,UC,MS,LC	260	US	20	no	
71	SE4NW4,2,27N,43E		1885	5/23/77	no	yes	US,UC,MS,LC	194	US	18	no	
72	NE4SW4,2,27N,43E		1885	7/10/78	no	yes	US,UC/LC,G	198	US,UC/LC	18	no	
73	SW4NW4,2,27N,43E		±1880	6/14/76	yes	yes	US	136	--	35	yes	
73a	N2NW4NW4SW4,2 27N,43E		±1878	11/19/76	yes	yes	US,UC	186	US	20	no	

TABLE 1 - Continued

Well No.	Well Location	Current Ownership	Land Surface Elevation (ft.)	Date Well Drilled	Field Location Checked	Pump Test Data Available	Units Penetrated* (top-bottom)	Casing Schedule: length (ft.)	Casing Schedule: cased out units*	Casing Schedule: depth of seal (ft.)	Water Quality Data Avail.	Type [illegible] Water Use*
73b	N2NW4NW4SW4,2	(b) (6) [redacted]	1880	11/27/76	yes	yes	US	195	--	20+	no	A
74	NW4NW4NW4,2,27N,43E		1890	7/5/76	no	yes	US	160	--	30	no	A
75	NW4NW4NW4,2,27N,43E		1890	4/6/77	no	yes	--UC/LC,B,G	220	nd	nd	no	A
76	E2SW4SW4,2,27N,43E		±1870	7/14/76	yes	yes	US,B,UC	161	US,B	18	no	A
77	E2SW4SW4,2,27N,43E		±1870	7/21/76	yes	yes	US,UC,MS	281	US,UC	18+	no	A
78	NE4SE4,3,27N,43E		±1865	5/22/79	yes	yes	US,UC,MS,G	230	US,UC	20	no	A
79	NE4SE4,3,27N,43E		±1860	6/18/79	yes	yes	US,UC,MS,LC,LS	201	US,UC, MS,LC	18	yes	A
80	NW4NE4NE4,3,27N,43E		1860	10/8/77	no	no	--UC,B,LC	245	UC	nd	no	A
81	NE4NW4,4,27N,43E		1820	2/15/80	no	yes	B,UC/LC	20	B	18	no	A
82	NE4NW4,4,27N,43E		1820	8/29/77	no	yes	UC,B/C,UC, MS,LC,G	181	US,B/C,UC, UC,MS,LC	18	no	A
83	NW4NW4,4,27N,43E		1980	5/1/74	no	yes	US,UC,B	148	US,UC	20	no	[illegible]
84	NW4NW4,4,27N,43E		2080	4/27/74	no	yes	US,UC,B	115	US,UC	20	no	[illegible]
85	4,27N,43E		2077	4/26/74	no	yes	US,UC,B	115	US,UC	20	no	[illegible]
86	SE4NW4,4,27N,43E		1900	8/17/77	no	yes	UC,B	160	UC	40	no	[illegible]
87	SW4,4,27N,43E		1880	12/3/76	no	yes	UC,B,UC,B	76	UC,B,UC	20	no	A
88	NW4NW4,4,27N,43E		1980	8/16/77	no	yes	B/C/B/C/B/C	100	B/C/B	40	no	A
89	N2,4,27N,43E		nd	3/10/77	no	yes	UC,B,UC/LC	135	UC	20	no	[illegible]
90	SE4NW4,4,27N,43E		1840	3/24/78	no	yes	US,B,UC/LC	23	US	18	no	[illegible]
91	NW4NW4,4,27N,43E		1900	3/15/77	no	yes	UC,B/C/B	36	UC	20	no	A
92	SE4NW4,4,27N,43E		1840	8/28/78	no	yes	UC,B	50	UC	40	no	A
93	SE4NW4,4,27N,43E		1840	11/2/77	no	yes	B	20	--	19	no	[illegible]
94	SW4NE4,4,27N,43E		1800	3/76	no	yes	UC,B	48	UC	20	no	[illegible]
95	SE4NW4,4,27N,43E		1840	11/1/78	no	yes	B,UC/LC	98	B	80	no	[illegible]
96	NE4NW4,4,27N,43E		1980	8/12/77	no	yes	B/C,C	51	--	50	no	
97	SE4NW4,4,27N,43E		±1840	12/24/76	no	yes	US,UC,MS,LC	76	US,UC,MS	18	no	
98	NE4,4,27N,43E		1720	9/10/76	no	yes	US,UC,MS	39	--	18	no	
99	NE4SW4,4,27N,43E		1840	8/28/76	no	yes	US/C,B	91	US/C	18	no	
100	4,27N,43E		1800	12/22/78	no	yes	B,UC,MS,LC	171	B,UC	40	no	
101	NE4,4,27N,43E		1700	12/14/78	no	yes	UC/LC,G	92	UC/LC	20	no	
102	NW4,4,27N,43E		2000	3/1/77	no	no	US,UC,B	nd	nd	nd	no	
103	4,27N,43E		±1800	2/21/80	no	yes	US,UC	31	US	25	no	
104	NE4SW4,4,27N,43E		1840	7/23/77	no	yes	B,UC/LC	19	--	18	no	
105	SW4SW4,4,27N,43E		1920	6/14/78	no	yes	US,UC,B	145	US,UC	18	no	
106	NW4NE4,4,27N,43E		1760	7/21/77	no	yes	UC,MS	120	UC	50	no	
107	4,27N,43E		nd	1/5/77	no	yes	B,C	21	--	20	no	
108	NE4NW4,5,27N,43E		2100+	12/12/78	no	yes	US,UC,B	132	US,UC	20	no	
109	NE4,5,27N,43E		2160	7/25/73	no	no	US,UC,B	196	US	nd	no	
110	NW4NW4,5,27N,43E		2160	10/30/73	no	yes	US,UC,B/C/B/ C/B/C	191	US,UC,B	nd	no	
111	NE4SE4NE4,5,27N,43E		2100	4/68	no	yes	B,UC,B	84	B,UC	0	no	
112	NE4NW45,27N,43E		2120	11/8/75	no	yes	US,UC,B/C/ B/C/B	141	US,UC	30	no	
113	8,27N,43E		nd	1/8/76	no	yes	US,UC,B	43	US,UC	20+	no	

TABLE 1 - Continued

Well No.	Well Location	Current Ownership	Land Surface Elevation (ft.)	Date Well Drilled	Field Location Checked	Pump Test Data Available	Units Penetrated* (top-bottom)	Casing Schedule length (ft.)	Casing Schedule cased out units*	depth of seal (ft.)	Water Quality Data Avail.	Typ of Wat
114	SW4NE4SE4,8,27N,43E	Mt. View Water Co.	1945	1967	no	no	nd	nd	nd	nd	no	
115	8,27N,43E	(b) (6) [redacted]	nd	10/19/76	no	yes	US,UC,B,C	47	US	20+	no	
116	NW4SW4,8,27N,43E		2080	5/13/76	no	yes	UC,MS,C,S,LC,B	80	UC,MS,C,S	18	no	
117	W2SW4,9,27N,43E		±1880	4/8/75	no	no	US,UC,MS,LC,B	207	US,UC, MS,LC	20	no	
118	SW4SE4,9,27N,43E		1745	3/3/76	no	no	US,UC,MS,LC	63	US	nd	no	
119	SW4SW4,9,27N,43E		1880	9/23/76	no	yes	US,UC	116	US	18	no	
120	SW4NW4,9,27N,43E		1880	6/17/74	no	yes	US,UC,B	98	US,UC	20	no	
121	SE4NW4,9,27N,43E		1800	4/5/79	no	yes	UC,MS,LC	124	UC	18	no	
122	SE4NW4,9,27N,43E		1800	4/2/79	no	no	abandoned and filled	101 pulled	--	18	no	
123	SW4SW4,10,27N,43E		1685	2/9/78	no	yes	US,UC,MS,C, B,LC,LS	190	US,UC,MS, C,B,LC	18	no	
124	SW4SW4,10,27N,43E		1680	5/19/78	no	yes	US,UC,MS	76	US,UC	18	no	
125	SW4SW4,10,27N,43E		1685	7/30/77	no	yes	US,UC/LC,G	57	US,UC/LC	20	no	
126	NW4NE4,10,27N,43E		1855	7/9/64	no	yes	US,UC	84	--	6	no	
127	10,27N,43E	Wahoo Water District	±1860	8/22/72	yes	yes	US,UC,MS	214	US,UC	nd	no	
128	SW4SW4,10,27N,43E	(b) (6) [redacted]	1885	2/9/78	no	yes	US,UC,MS,C, B,LC,LS	190	US,UC,MS, C,B,LC	18	no	
129	NW4NW4,10,27N,43E		1678	5/20/77	no	yes	US,UC,MS	59	US,UC	25	no	
130	SE4SE4SE4,10,27N,43E		1859	4/15/77	no	yes	US,UC,MS	245	US	nd	no	
131	SE4SE4SE4,10,27N,43E		1855	7/11/74	no	yes	US,UC,MS,LC, LS,DG	282	US,UC,MS	18	no	
132	SW4NW410,27N,43E		1670	10/20/76	no	yes	US,UC	40	--	20	no	
133	SE4SW4,11,27N,43E		1850	9/7/76	no	yes	--UC/LC,MS/LS	176	--	nd	no	
134	SE4NW4,11,27N,43E		±1860	11/56	yes	no	US	170	--	nd	no	
135	NE4SE4,12,27N,43E		1875	6/20/78	no	yes	US,G	27	US	18	no	
136	W2SW4,12,27N,43E		1880	10/26/77	no	yes	US,UC/LC,G	67.5	US,UC/LC	20	no	
137	NW4NE4,12,27N,43E		1910	7/27/73	no	yes	UC,MS,LC,S,B	144	UC,MS	18	no	
138	NW4NW4,13,27N,43E		1846	6/10/76	no	yes	US,UC,MS	230	US,UC	20	no	
139	SW4NW4,13,27N,43E		1860	6/20/75	no	yes	G	19	--	20	no	
140	E3/4NE4NW4,14,27N,43E		1857	8/30/75	no	no	US	194	--	20	no	
141	SW4NW4NW4,14,27N,43E		1855	10/8/75	no	yes	US	100	--	20	no	
142	NW4SW4,14,27N,43E		1845	7/6/76	no	yes	US,UC,MS	238	US,UC	18	no	
143	NE4NW4,14,27N,43E		1855	8/2/76	no	yes	US,UC,MS	231	US,UC	18	no	
144	NE4NE4,15,27N,43E		1852	5/27/77	no	yes	US,UC,MS	246	US,UC	84	no	
145	N2,15,27N,43E		1850	12/29/76	no	yes	US,UC,MS,LC,G	305	US,UC	18	no	
146	N2,15,27N,43E		1850	12/29/76	no	yes	US,UC,MS,LC,G	305	US,UC	18	no	
147	SE4NW4,15,27N,43E		1842	5/31/78	no	yes	US,UC,MS	241	US,UC	18	no	
148	SE4NW4,15,27N,43E		1842	2/24/78	no	yes	US,UC,MS	197	US,UC	18	no	
149	SW4NW4,15,27N,43E		1793	10/10/73	no	yes	US,UC	170	US	20	no	
150	S2,15,27N,43E		1842	7/17/79	no	yes	US,UC,MS	224	US	20	no	
151	NE4NW415,27N,43E		1849	6/24/76	no	yes	US	80	--	20	no	
152	NE4SE4,15,27N,43E		1847	12/28/70	no	yes	US,UC	92	--	nd	no	

TABLE 1 - Continued

Well No.	Well Location	Current Ownership	Land Surface Elevation (ft.)	Date Well Drilled	Field Location Checked	Pump Test Data Available	Units Penetrated• (top-bottom)	Casing Schedule length (ft.)	Casing Schedule cased out units•	depth of seal (ft.)	Water Quality Data Avail.	Type of Water Use
153	NE4SW4NW4,16,27N,43E	(b) (6) [redacted]	1890	nd	no	no	B	nd	nd	nd	no	A,D
154	SW4NE4,16,27N,43E		1700	6/8/59	no	yes	nd	nd	nd	nd	no	nd
155	SW4NW4,16,27N,43E		1800	8/17/73	no	no	B,UC	55	B	20	no	A
156	NE4SE4,16,27N,43E		1780	4/22/77	no	yes	UC	72	--	70	no	A
157	NW4NE4,16,27N,43E		1680	9/8/77	no	yes	US,UC,MS,LC	192	US,UC	18	no	A
158	NE4SW4,16,27N,43E		1764	7/5/78	no	yes	US,UC,MS	156	US	40	no	A
159	SW4SE4,16,27N,43E		1680	7/25/78	no	yes	B/C/B	20	B/C	20	no	A
160	SW4SE4,16,27N,43E		1630	8/21/78	no	yes	UC/LC,G	74	UC/LC	18	no	A
161	SW4NW4,16,27N,43E		1800	8/17/73	no	no	B,UC	55	B	20	no	A
162	NE4SW4,16,27N,43E		1700	4/21/75	no	no	US,C/B	53	--	20	no	A
163	NW4NE4,16,27N,43E		1680	4/22/75	no	yes	US,UC,MS	115	US,UC	nd	no	A
164	NW4SW4,17,27N,43E		2060	6/10/80	no	yes	--G	140	--	nd	no	A
165	NE4NE4,17,27N,43E		1905	8/16/73	no	no	US,UC,MS	83	US,UC	20	no	A
166	S2,NE4,17,27N,43E		1935	11/30/63	no	yes	UC	10	--	nd	no	A,D
167	SE4,17,27N,43E		2000	5/21/65	no	no	UC,B,LC,MS/LS	323.5	UC,B	0	no	A
168	NE4SW4,17,27N,43E		1975	2/1/74	no	yes	US,UC,MS	42	US	20	no	A
169	SE4,17,27N,43E		2000	5/21/65	no	no	UC,B,LC,MS/LS	323.5	UC,B	0	no	A
170	SW4SW4,17,27N,43E		2020	10/31/75	no	yes	US,G	74	US	18	no	A
171	NW4NE4,17,27N,43E		1970	7/10/73	no	no	US	11	--	nd	no	A
172	17,27N,43E		nd	5/23/69	no	yes	US,B	65	US	nd	no	[illegible]
173	NE4NE4,17,27N,43E		1905	8/16/73	no	no	US,UC,MS	83	US,UC	20	no	[illegible]
174	17,27N,43E		1987	2/5/74	no	yes	US,B,S,B	85	US,B,S	18	no	A
175	SW4SW4,17,27N,43E		2020	10/31/75	no	yes	US,G	74	US	18	no	A
176	SW4SW4,17,27N,43E		2020	6/15/76	no	yes	US,UC,MS,LC, LS,G	261	US,UC,MS, LC,LS	20	no	A
177	W2NW4NE4SW4,17, 27N,43E		1990	11/2/76	no	yes	US,B,G	60	US	40	no	A
178	NE4NE4,17,27N,43E		1905	1/9/78	no	yes	US,UC,B	61	US,UC	18	no	A
179	NW4NE4,17,27N,43E		1975	5/26/77	no	yes	UC,B,UC/LC,B	51	UC	18	no	A
180	NE4NE4,17,27N,43E		1905	8/3/78	no	yes	US,G	20	US	18.5	no	A
181	NW4SW4,17,27N,43E		2060	10/79	no	yes	US,UC,MS,B	65	US	20	no	A
182	NW4SW4,17,27N,43E		2060	10/79	no	yes	US,UC,MS,B	65	US	20	no	A
183	NE4NE4,17,27N,43E		1905	1/7/78	no	yes	US,UC,B	76	US	18	no	A
184	NE4SW4,17,27N,43E		1960	3/23/77	no	yes	B	24	--	24	no	A
185	E2E2,3,27N,43E(h)		±1878	nd	yes	nd	nd	nd	nd	nd	yes	A
186	N2NE4SE4,3,27N,43E(g)		1878	3/20/78	no	yes	US,UC,MS	198.5	US,UC	20	no	A
187	E2W2,3,27N,43E		±1700	nd	yes	nd	surface	nd	nd	nd	yes	surf
188*	N2SE4NE4,3,27N,43E		±1878	nd	no	nd	nd	nd	nd	nd	yes	A
189*	NW4SW4,2,17N,43E		±1878	nd	no	nd	nd	nd	nd	nd	yes	A
190*	NE4SW4,2,27N,43E		±1880	nd	no	nd	nd	nd	nd	nd	yes	A
191*	W2SE4,10,27N,43E		±1850	nd	no	nd	nd	nd	nd	nd	yes	A
192*	SW4SW4,2,27N,43E		±1865	nd	yes	nd	nd	nd	nd	nd	yes	A
193*	NW4,10,27N,43E	North Glen Estates	±1700	nd	no	nd	nd	nd	nd	nd	yes	A
194*	SW4NE4,10,27N,43E	(b) (6) [redacted]	±1820	nd	no	nd	nd	nd	nd	nd	yes	[illegible]
195*	NE4SW4,10,27N,43E		±1800	nd	nd	nd	nd	nd	nd	nd	yes	A

TABLE 1 - Continued

Well No.	Well Location	Current Ownership	Land Surface Elevation (ft.)	Date Well Drilled	Field Location Checked	Pump Test Data Available	Units Penetrated* (top-bottom)	Casing Schedule: length (ft.)	Casing Schedule: cased out units*	depth of seal (ft.)	Water Quality Data Avail.	Type of W[illegible]**
196*	SW4SW4,2,27N,43E	(b) (6) [redacted]	±1865	8/24/81	yes	yes	US,UC,B, UC/LC,G	327	US,UC,B	±327	no	A,D
197*	SE4SW42,27N,43E		1865	4/3/81	no	yes	US,UC,B,C,B	139	US,UC,B,C	40	no	A
198*	SE4SW4,2,27N,43E		1865	3/13/81	no	yes	DG,G	380.6	--	nd	no	A
199*	NW4NW4,2,27N,43E		1900	5/11/76	no	yes	US,--,UC,B	135	US	19	no	A
200*	NW4,10,27N,43E	Lincoln Green of WA	1680	8/22/69	no	yes	US	75	--	13	no	C

LEGEND

* US = upper sand/gravel
UC = upper clay
MS = middle sand/gravel
LC = lower clay
LS = lower sand/gravel
DG = decomposed granite
G = granite
B = basalt
C = clay
S = sand

** A = domestic
B = industrial
C = municipal
D = irrigation
E = test well
F = other

* not included in map of well locations from legal descriptions (fig. 1)

TABLE 4 - Water quality on October 23, 1980 at selected wells near the Colbert Landfill, Spokane County, Washington.

Samples Collected: October 23, 1980
Laboratory: Washington State DSHS
Aquifer:

Well Number:		nd 192	LS 79	nd 191	surface	nd 194	nd 195	nd 193
Owner:	Recommended Limits	(b) (6) [redacted]			King Springs	(b) (6) [redacted]		N. Glen Estates
Tests	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)
Arsenic	0.05^P	0.010	0.010	0.010	0.010	0.010	0.010	0.010
Barium	1.0^P	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Cadmium	0.01^P	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Chromium	0.05^P	0.010	0.010	0.010	0.010	0.010	0.010	0.010
Iron	0.3	0.5	0.05	0.05	0.05	0.05	0.05	0.05
Lead	0.05^P	0.010	0.010	0.010	0.010	0.014	0.010	0.010
Manganese	0.05	0.205	0.010	0.010	0.010	0.054	0.010	0.010
Mercury	0.002^P	0.0005	0.0005	0.0005	0.0005	0.0010	0.0005	0.0005
Selenium	0.01^P	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Silver	0.05^P	0.010	0.010	0.010	0.010	0.010	0.010	0.010
Sodium		15	10	10	10	10	10	10
Hardness		130	320	280	180	140	220	180
Conductivity (Micromhos/cm @ 25°C)	700	7300	610	*	400	270	470	*
Turbidity	1.0^P	1.8	0.3	0.2	0.1	0.2	0.1	0.1
Fluoride	2.0^P	0.3	0.2	0.2	0.2	0.2	0.3	0.2
Nitrate	10.0^P	0.5	1.3	3.4	0.2	0.4	2.4	1.2
Chloride	250							
Sulfate	250							

P = EPA Primary Standard Maximum Contaminant Levels
* = Data not readable

TABLE 6. Water quality on December 5, 1980 at selected wells near the Colbert Landfill, Spokane County, Washington.

Samples collected:	December 5, 1980					
Laboratory:	EPA, Seattle					
Aquifer:	UC	US	nd	nd	MS	nd
Well Number:	73a	73b	188	189	186	190
Owner:	Rhodes	Armon	Resseman	Krouter	King	Hollenbeck
Compound	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)
Methylene Chloride	nd	nd	trace	nd	nd	nd
Chloroform	8.5	7.3	--	--	6.9	--
1,1-Dichloroethylene	110	7.4	5.4	6.0	112	6.9
1,2-Trans-Dichloroethylene	trace	--	--	--	4.4	--
Trichloroethylene	--	--	--	--	--	--
1,1,1-Trichloroethane	1250 1110	44	1.1	1.5	1640 1540	1.4

TABLE 7 - Water quality on February 10 and 11, 1981 at selected wells near the Colbert Landfill, Spokane County, Washington.

Samples Collected: February 10 and 11, 1981
Laboratory: EPA, Seattle

Aquifer:	LS	surface	MS	nd	US	UC
Well Number:	79		186	185	73b	73a
Owner:	[redacted] Well (µg/l)	[redacted] Springs (µg/l)	[redacted] Well (µg/l)	[redacted] Well (µg/l)	[redacted] Well (µg/l)	[redacted] Well (µg/l)
PESTICIDES						
PCB 1260	--	N/A	N/A	N/A	N/A	N/A
BASE NEUTRAL EXTRACTABLES						
Bis (2-Ethylhexyl) Phthalate	--	2	--	--	7	--
N-Butyl Benzyl Phthalate	--	--	--	--	--	--
Di-N-Butyl Phthalate	--	2	--	--	2	--
Di-N-Octyl Phthalate	--	1	--	--	--	--
Diethyl Phthalate	--	1	--	--	1	--
ACID COMPOUNDS	--	--	--	--	--	--
VOLATILE ORGANICS b/						
Tetrachloromethane (Carbon Tetrachloride)	--	--	--	--	3.3	--
1,2-Dichloroethane	3	--	--	5	3	4.3
1,1,1,-Trichloroethane	9400	33	1700	2100	53	1080
1,1-Dichloroethane	55	--	64	80	--	43
Trichloromethane (Chloroform)	1.3	--	--	--	--	--
1,1-Dichloroethylene	380	--	--	--	--	--
1,2-Trans-Dichloroethylene	--	--	--	--	--	--
Dichloromethane (Methylene Chloride)	34	--	--	--	--	--
Dichlorobromomethane (Bromodichloromethane)	--	--	--	--	--	--
Tetrachloroethylene	--	--	--	--	--	--
Trichloroethylene	12	--	--	--	--	--

a/ This table is based on analyses by the Region 10 EPA Laboratory for organic "priority pollutants".
b/ Volatile organics - Reported concentrations are gas chromatograph (GC) results.
-- Not detected - less than the detection limit.
N/A Not applicable

NOTE: 5/1/81 telephone conversation with [redacted] Region 10 EPA, indicated that none of the above compounds were detected in [redacted] or [redacted] wells. These wells were not included on the chart for that reason.

TABLE 5 - Water quality on November 24, 1980 at selected wells near the Colbert Landfill, Spokane County, Washington.

Samples collected: November 24, 1980
Laboratory: EPA, Seattle

Aquifer:	LS	LS	LS	LS	nd		nd	nd	nd	surface	LS
Well Number:	79	79	79	79	185		193	191	192		79
Owner:	[redacted]				[redacted]		North Glen	[redacted]		King Springs	[redacted]
	[inside]	[inside]	[outside]	[outside]							[insid
Compound	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)		(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l
Chloroform	7.9	10	10	10	9.5	9.7	--	--	--	--	7
1,1-Dichloroethylene	230	230	250	220	36	38	--	--	--	--	180
1,2-Dichloroethylene	75	77	73	76	3.9	3.9	--	--	--	--	72
1,1,1-Trichloroethane	9100	9500	10300	9600	1460	1340	--	1.3	1.7	14	5200 5400
Trichloroethylene	19	20	20	20	1	1	--	--	--	--	9.

Table 1

Concentrations in Water of Selected a/ Organic Compounds for Sampling Conducted February 10 and 11, 1981

(Units of Micrograms Per Liter)

	(b) (6) [redacted] Well	Northside 208 Well	(b) (6) [redacted] Well	Well	Spring	Well	Well	Well	Well	Mica Monitoring Well	Hidden Hollow Well
PESTICIDES											
PCB 1260	0.36 b/	--	--	--	NA	NA	NA	NA	NA	NA	NA
BASE NEUTRAL EXTRACTABLES											
Bis (2-Ethylhexyl) Phthalate	--	--	1	--	2	--	--	7	--	NA	NA
N-Butyl Benzyl Phthalate	4	7	1	--	--	--	--	--	--	NA	NA
Di-N-Butyl Phthalate	1	2	1	--	2	--	--	2	--	NA	NA
Di-N-Octyl Phthalate	--	--	--	--	1	--	--	--	--	NA	NA
Diethyl Phthalate	3	2	1	--	1	--	--	1	--	NA	NA
ACID COMPOUNDS	--	--	--	--	--	--	--	--	--	NA	NA
VOLATILE ORGANICS c/											
Tetrachloromethane (Carbon Tetrachloride)	--	--	--	--	--	--	--	3.3	--	--	--
1,2-Dichloroethane	10	--	--	3	--	--	5	3	4.3	--	--
1,1,1-Trichloroethane	--	25	--	9,400	33	1,700	2,100	53	1,080	42	40
1,1-Dichloroethane	--	--	--	55	--	64	80	--	43	--	--
Trichloromethane (Chloroform)	11	--	--	1.3	--	--	--	--	--	--	--
1,1-Dichloroethylene	--	--	--	380	--	--	--	--	--	--	--
1,2-Trans-Dichloroethylene	115	--	--	--	--	--	--	--	--	--	--
Dichloromethane (Methylene Chloride)	--	--	--	34	--	--	--	--	--	--	--
Dichlorobromomethane (Bromodichloromethane)	1.4	--	--	--	--	--	--	--	--	--	--
Tetrachloroethylene	23	--	--	--	--	--	--	--	--	--	--
Trichloroethylene	8.3	--	--	12	--	--	--	--	--	--	--

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a/ This table is based on analyses by the Region 10 EPA Laboratory for organic "priority pollutants".
b/ No blank was available for comparison with this result.
c/ Volatile organics--Reported concentrations are gas chromatograph (GC) results.
-- Not detected (less than the detection limit).